

WHAT IS CLAIMED IS:

1. An active broad-band reception antenna having a passive antenna part (1), with first and second output connectors (18, 1') with a frequency dependent effective length l_e for use on a vehicle wherein the internal amplification of its active antenna is reduced when a predetermined reception signal level is exceeded, comprising;

a high-impedance, high frequency control connector (15) connected to the first connector (18) of the passive antenna part (1);

at least one amplifier circuit (21) having at least one three-pole amplification element (2), with its input coupled to said control connector (15);

at least one transformation network (31) disposed within said amplification circuit (21) and comprising

an adjustable transformation member (34) having at least one adjustable electronic element (32) coupled to the output (24) of said at least one three pole amplification element (2) for adjustable lowering of the reception signal level; and

at least one low loss filter (3) having its input (6) coupled to said adjustable transformation member (34), and an output connected to said network (31), said transformation

network (31), having an input admittance (7, 7') at its input (24) designed for receiving low intensity, high-frequency reception signals (8), and loaded with a continuing circuit at its output (4);

a control circuit (33) coupled to the output (4) of said amplification circuit (21) and producing a control signal (42) that is fed back to said adjustable transformation member (34) in said transformation network (31) for producing a counter-coupling and linearizing effect in the high-frequency connection between said amplification element output (24) and the second connector (1') of the passive antenna part (1), so that said input admittance (7') of said transformation network (31) is reduced when there is a reduction of the level of the high-frequency reception signal (8).

2. The active broad-band reception antenna according to claim 1, wherein said transformation member (34) comprises at least one reactive element (32) of said low-loss transformation network (31), and selected so that the frequency dependence of the active admittance $G(f)$ of said input admittance (7) in effect at the input of said transformation network (31) is set so that at a given internal amplification of said amplifier circuit (21), the frequency

response signal (8) that results from the frequency-dependent effective length l_e of the passive antenna part (1) is designed within a broad frequency band.

3. The active broad-band reception antenna according to claim 1, wherein said transformation network (31), comprises a series circuit of an adjustable transformation member (34), said low-loss filter circuit (3) having fixed reactive elements with an impedance (5) of the continuing circuit coupled to its output (4), said adjustable transformation element (34) being designed for frequency-independent and low-loss signal transmission if the received signal decreases below a predetermined reception level, and the reactive elements of said low-loss filter circuit (3) are structured so that the frequency dependence of the active admittance $G(f)$ of the input admittance (7) in effect at its input (24) is set so that at a given internal amplification of the active antenna, the frequency response in the high-frequency reception signal (8) that results from the frequency-dependent effective length l_e of the passive antenna part (1) is structured within a broad frequency band.

4. The active broad-band reception antenna according to claim 1 wherein said transmission network (31)

comprises a low-loss filter circuit having fixed reactive elements (20) wherein at least one reactive element (20a) can be switched on and off using at least one adjustable electronic element (32) so that if the received signal goes below a predetermined reception level the desired frequency dependence of the active admittance $G(f)$ of the input admittance (7) that is in effect at its input (24) increases internal amplification of the active antenna, and if the received signal goes above a predetermined reception level, the desired frequency dependence of the active admittance $G'(f)$ of the input admittance (7') at its input (24) decreases the internal amplification of the active antenna.

5. The active broad-band reception antenna according to claim 1, wherein said transformation network (31), designed as a filter has a sufficiently small reactive component $B(f)$ in its input admittance (7) if the reception signal goes below a predetermined reception level, and in the case of a predetermined transformation behavior, in order to avoid non-linear effects.

6. The active broad-band reception antenna according to claim 4, wherein for all settings of said at least one adjustable electronic element (32), the amount of the

effective counter-coupling input admittance (7,7') outside of the useful frequency band in the stop frequency range of said transformation network (31) designed as a filter and connected to the input connector (24), is sufficiently small to avoid non-linear effects at all settings of said adjustable electric element (32) or elements (32).

7. The active broad-bank reception antenna according to claim 1, wherein said transformation network (31) is formed from the series circuit of said adjustable transformation member (34) designed as a transformation circuit, having an adjustable longitudinal element (30) contained therein, and a low-loss filter circuit (3), and the ratio ($t:1$) of the input voltage (U_E) to the output voltage (U_A) of said adjustable transformation member (34) is set to be sufficiently great if a predetermined reception level is exceeded.

8. The active broad-band reception antenna according to claim 7, wherein said adjustable longitudinal element (30) is designed as an electronic resistor (37) having an adjustable PIN diode.

9. The active broad-band reception antenna according to claim 7, wherein said adjustable longitudinal element (30) is formed by one or several resistors (35) switched in series, each having an adjustable electronic element (32) that can be set and switched in parallel with said resistor (35) said electronic element (32) being designed as a switching diode (36) and wherein said related resistor is fully active when said element (32) is set in the cut-off state, and said resistor (35) is shunted when said switching diode (36) is set in the pass-through state, so that said switching diode (36) or diodes are switched on/off appropriately so as to stepwise lower the level of the reception signal.

10. The active broad-band reception antenna according to claim 7, wherein in order to lower the high-frequency reception signals (8) independent of frequency, said adjustable longitudinal element (30) comprises a frequency-dependent dipole (47) having a dipole admittance (46) that is similar, but essentially smaller than the input admittance of said low-loss filter circuit (3), by a frequency-independent factor $(t-1)$ and further comprising a switching diode (36) switched in parallel with said frequency-dependent dipole (47) when the latter is set in the cut-off state and said dipole

admittance (46) is active, and when set in the pass-through state, said dipole admittance (46) is shunted so that when said switching diode (36) is cut off, the high-frequency reception signals (8) are reduced by a factor (t), essentially independent of the reception frequency.

11. The active broad-band reception antenna according to claim 10, wherein said frequency-dependent dipole (47) is formed by the input admittance of a dipole filter circuit (48), which is designed as a low-loss filter circuit (3), at least in the essential reactive elements, wherein the reactive elements are selected to be higher in ohms by the frequency-independent factor $(t-1)$ than the corresponding reactive elements of said low-loss filter circuit (3), and wherein in said dipole filter circuit (48) is terminated by an impedance that is selected to be higher in ohms by the same factor than the active impedance (5) of the continuing circuit (4).

12. The active broad-band reception antenna according to claim 1, wherein said transformation network (31) comprises an adjustable transformation member (34) having a transformer (38) with a translation ratio (t) available in steps, and wherein said at least one adjustable element (32)

comprises switching diodes (36), which are switched on and off so that at high reception levels, the translation ratio (t), and therefore the ratio of the input voltage U_E to the output voltage U_A of said adjustable transformation member (34) is set to be correspondingly high.

13. The active broad-band reception antenna according to claim 1, wherein said transformation network (31) has several low-loss filter circuits (3, 3a) with reactive elements (20) having a fixed setting, and the input and output of said filter circuits (3, 3a) are coupled to switching diodes (36), wherein said filter circuits are alternatively switched between the input and output of said transformation network (31), and the input admittance (7, 7') is formed with said reactive elements (20) so that by using said switching diodes (36), if the value of the reception signal decreased below a predetermined reception level, the desired frequency dependence of the active admittance $G(f)$ of the input admittance (7) in effect at the source connector (24) provides a greater internal amplification of the active antenna, and if the value goes above a predetermined reception level, the desired frequency dependence of the active admittance $G'(f)$ of the input admittance (7') that is in effect at the source

connector (24) reduces the internal amplification of the active antenna.

14. The active broad-band reception antenna according to claim 1, wherein said three-pole amplification element (2) comprises a field effect transistor, the gate terminal being connected to the high impedance control connector (15), the source terminal being connected to the source connector (24) and the drain terminal being connected to the drain connector (53).

15. The active broad-band reception antenna for use above 30 MHz according to claim 14, wherein said field effect transistor (2) has a parallel noise current source i_r , a very small gate-drain capacitance C_1 , and a very small gate-source capacitance C_2 , and an $1/f$ noise that is sufficiently small to be insignificant, and that its minimal noise temperature T_{NO} is significantly lower than the ambient temperature T_0 during noise adaption.

16. The active broad-band reception antenna according to claim 1, wherein said three-pole amplification element (2) comprises an expanded three-pole amplification element, consisting of an input field effect transistor (13),

and a bipolar transistor (14) being controlled by the source of the latter in an emitter following circuit, and the output of said expanded field effect transistor (2) is formed by its emitter connector (12).

17. The active broad-band reception antenna according to claim 1, wherein said three-pole amplification element (2) comprises an expanded three-pole amplification element, having a first input bipolar transistor (49), a second bipolar transistor (50) being controlled by the emitter of the latter in an emitter follower circuit, and the output connector (24) of the three-pole amplification element (2) being formed by its emitter connector (12), and the closed-circuit current being set to be smaller in said first input bipolar transistor (49) than in said second bipolar transistor (50).

18. The active broad-band reception antenna according to claim 1, wherein said three-pole amplification element (2) comprises an expanded three-pole amplification element, consisting of an input bipolar transistor (49) or a field effect transistor (13) respectively, the collector, or drain connector of which is connected with the emitter connector of a second transistor (51), and the base or gate

connector of which is connected with the emitter, or source connector of said input bipolar transistor (49) or said input field effect transistor (13) respectively, forming the source connector (24) of said three-pole amplification element (2).

19. The active broad-band reception antenna according to claim 1, wherein said three-pole amplification element (2) comprises;

an expanded three-pole amplification element, consisting of an input bipolar transistor (49) or a field effect transistor (13) respectively, the collector connector, or drain connector of which is connected with the emitter connector of a second transistor (51);

an electronically controllable closed-circuit voltage source (U_{D0}) coupled to the base or gate connector of said second transistor (51); and
an electronically controllable closed circuit current source (I_{S0}) coupled to the emitter of said input bipolar transistor (49) so that if overly high reception levels occur, said current (I_{S0}) or/and said closed circuit voltage (U_{D0}) coupled to said input bipolar transistor (49) or said input field effect transistor (13), respectively, is set higher

when there is a reduction of the internal amplification of the reception antenna.

20. The active broad-band reception antenna according to claim 1 wherein the passive antenna part (1) has two signal output connectors (18) with respect to ground (0) and said three pole amplification element (2) has two inputs (15a, 15b) each connected with one of said antenna part connector (18) and having two output source connectors (24a, b); and wherein the drain connectors (53) are connected with the ground (0)

a transformer (38) structured as an isolating transformer having its primary side connected to said two output source connectors (24a, b), the secondary side of which has different outputs for structuring different transformer ratios (t), and switching diodes (36) coupled to the outputs of said adjustable member (34).

21. The active broad-band reception antenna according to claim 1, wherein said three pole amplification element comprises a plurality of three pole amplification elements (2,2) and a plurality of bipolar transistors (14, 14') combined with said plurality of three pole amplification elements (2, 2'), the base electrodes of said bipolar

transistors (14, 14'), being connected with the source electrode of a common input transistor (13, 49) and with the source connector of said expanded three-pole amplification element, and wherein said bipolar transistors (14, 14') are each connected with the input of a low-loss filter circuit (3, 3'), in an emitter follower circuit, to form separate transmission paths for the frequency bands in question, and wherein, there is an adjustable transformation member (34, 34') and a control circuit (33, 33') for each of the transmission paths and only the frequency band assigned to the transmission path in question is passed to the latter from the high-frequency reception signal (8), by way of filter measures, and that said control signal (42, 42') is passed to the assigned adjustable transformation member (34, 34'), in each instance, in order to provide several transmission frequency bands for said reception antenna.

22. The active broad-band reception antenna according to claim 21, wherein said control circuit (33) comprises a receiver (44) having control amplifiers (33, 33') for producing control signals (42, 42') derived from the output signal of said active antenna by means of selection means, and passed to the active antenna by way of control

lines (41) connected to said adjustable transformation member (34).

23. The active broad-band reception antenna according to claim 1, wherein a plurality of passive antenna parts (1) are present, which have directional diagrams with effective lengths l_e , that are frequency-dependent and differ with respect to incident waves, by amount and phase, but are in electromagnetic radiation coupling with one another and together form a passive antenna arrangement (27) having several output connection points (18a, b, c), and wherein said amplification circuit has a plurality of amplifier circuits (21a, b, c) connected with it, in each instance, and is supplemented to form an active antenna, so that by switching on said amplifier circuits (21a, b, c) at the passive antenna parts (1), no noticeable reciprocal influence of the reception voltages exists;

an antenna combiner (22) for bringing together the high-frequency signals (8a, b, c) in weighted manner and said control circuit (33) comprises at least one control amplifier (33) for monitoring the high-frequency reception signals (8) in the active reception antennas, at the antenna output, in each instance.

24. Active broad band reception antenna according to claim 23, wherein said control amplifier (33) is a common control amplifier (33), the control signal (42a, b, c) of which is passed to said transformation networks (31a, b, c) in the active antennas, to lower the level of the totaled high-frequency reception signal (8).

25. The active broad-band reception antenna according to claim 24, wherein the active reception antennas are used in an antenna diversity system of vehicles, and that the passive antenna parts (1) are selected so that their reception signal, that are present in a Rayleigh reception field, are as independent of one another as possible in terms of diversity, and that the high frequency reception signals (8) are made available without feedback, and without influencing the independence of the reception signals in terms of diversity, for selection in a scanning diversity system, and for further processing in one of the known diversity methods.

26. The active broad-band reception antenna according to claim 25, wherein the active reception antennas are used in an antenna diversity system for vehicles, and the passive antenna parts (1) are selected so that their reception

signals that are present in a Rayleigh reception field, are as independent of one another as possible, in terms of diversity, and that the high-frequency reception signals (8) are made available without feedback, so as not to influence the independence of the reception signals in terms of diversity, for selection in a scanning diversity system, and for further processing in one of the known diversity methods, and that the level of the selected signal is passed to said common control amplifier (33), in which a control signal (42) is formed and passed to said transformation networks (31) in the active reception antennas, to reduce the selected high frequency reception signal (8).

27. The active broad-band antenna according to claim 25, wherein said control amplifier (33) is present in each of said active reception antennas (21), to monitor the high-frequency reception signals (8) at the antenna output.

28. The active broad-band antenna according to claim 25, comprising a plurality of susceptances, each coupled parallel to the input of each amplifier circuit (12) to improve the independence, in terms of diversity, of the reception signals of the passive antenna parts (1) at their

connection points (18) particularly determined for this purpose.

29. The active broad-band antenna according to claim 1, wherein said transmission network (31) is set for small high-frequency reception signals (8), the active admittance (5) in effect at the output (4) of said low-loss filter circuit (3) is structured by the input resistance of a high-frequency line (10) loaded with the load resistance (9) at its end, and that the load resistance (9) is formed by the input impedance of a continuing amplifier unit (11) having the noise number F_v , and that the real part G of the active admittance (7) is selected to be sufficiently large so that the noise contribution of said amplifier unit (11) is smaller than the noise contribution of said field effect transistor (2).

30. The active broad-band antenna according to claim 1, comprising a transformer (24') having a suitable transformer ratio \ddot{u} , coupled between the passive antenna part (1) and the input of said amplifier circuit (21) in order to create advantageous transformation conditions over a broad band.

31. The active broad-band reception antenna according to claim 1 wherein, frequency-selective transmission paths for a frequency-selective uncoupling of high-frequency reception signals (8) for different transmission frequency bands are structured in the loss filter circuit (3), several outputs, using signal branchings.

32. The active broad-band reception antenna according to claim 1 wherein the passive antenna part (1) comprises a passive antenna arrangement (27) having conductor structures disposed on plastic carrier introduced into the recess of a conductive vehicle body, or onto the window of a vehicle, in the form of one or more heating fields and conductor structures separate from the heating system, and wherein several connection points (18) are provided on these conductor structures to form passive antenna parts (1), to connect said amplifier circuits (21).

33. The active broad-band reception antenna according to claim 1, wherein the passive antenna arrangement (27) is structured as an essentially integral conductive surface, having sufficiently low surface resistance and applied to the window of a car, in order to suppress radiation transmission in the infrared range, and that suitably

positioned connection points (18) having corresponding amplifier circuits (21) are formed on the edge of the conductive surface, not connected with the conductive car body, in order to uncouple reception signals, the high-frequency reception signals (8) of which circuits are passed to an antenna combiner (22), in order to form a directional antenna, or to an electronic transformer (25), in order to provide a scanning diversity system, or to provide a working diversity arrangement.

34. The active broad-band reception antenna according to claim 1, wherein the passive antenna part is derived from a vehicle part that was not originally intended for use as an antenna, and can be changed only very little in its structure, and that a connection point (18) for the formation of a passive antenna part (1) is formed on this element, and that a specific azimuthal average D_m of the coefficient of directivity is determined for the polarization and elevation of an incident wave that applies in the useful frequency range, and that the real part R_A of the impedance \underline{Z}_A of the passive antenna part (1) exists in the transmission frequency range, in the range between R_{Amin} and a maximum value R_{Amax} .

35. The active broad-band reception antenna according to claim 1, wherein a modern digital computer is provided to determine both the impedance Z_A of the passive antenna part (1), by means of measurement technology or by calculations, and the azimuthal average D_m of the coefficient of directivity, determined by means of measurement technology, or by calculations, and stored in the digital computer, and in which suitable basic structures for low-loss filter circuits (3) are stored in the computer for various characteristic possible progressions of antenna impedances, and that the reactive element of said low-loss filter circuit (3) for a given average gain of the active antenna are determined using known strategies of variation calculations.

36. The active broad-band reception antenna according to claim 1, wherein said low-loss filter circuit (3) comprises a T half-filter or T-filter or a chain circuit of such filters, the serial and the parallel branch, respectively of said filters being formed of a combination of reactive resistors, so that both the absolute value of a reactive resistor in the serial branch (28), and the absolute value of a reactive resistor in the parallel branch (29) are sufficiently small, each case within a transmission frequency range, and sufficiently large outside such a range, and that

said high-frequency reception signal (8) is passed to said control amplifier (33) at its output so that said adjustable transformation member (34) is controlled by the control signal (42) of said control amplifier.

37. The active broad-band reception antenna according to claim 1, further comprising a high frequency line (10) contained in said low-loss filter circuit (3) as an element that transforms the active admittance (7) in frequency-dependent manner, in order to spatially separate the front end of the active antenna that is structured in miniaturized form.

38. The active broad-band reception antenna according to claim 1, wherein the passive antenna part (1), designed as a printed conductor structure on a dielectric carrier, such as, the window or a plastic carrier, and said low-loss filter circuit (3) is designed as a band-pass filter in the VHF frequency range, and a high-ohm input impedance outside of the VHF frequency range.

39. The active broad-band reception antenna according to claim 1 comprising a transformer (24) having a sufficiently high-ohm primary inductance, and a suitably

selected transformer ratio, coupled between said first connector (18) and the input of said amplifier circuit (21) in order to increase the effect length l_e of the passive antenna part (1), over a broad band.

40. An active broad-band reception antenna having a passive antenna part (1), with at least one output connector (18,) with a frequency dependent effective length l_e for use on a vehicle, wherein the internal amplification of its active antenna is reduced when a predetermined reception signal level is exceeded, comprising;

an least one amplifier circuit (21) having at least one three-pole amplification element (2, 13, 14)), with its input coupled to at least one output connector (18) of the antenna part (1);

at least one transformation network (31) disposed within said amplification circuit (21) and having at least one adjustable electronic element (32), and coupled to the output (24) of said at least one three pole amplification element (2) for adjustable lowering of the reception signal level;

a low loss filter (3) having its input (6) coupled to said adjustable transformation network (31), and having an input admittance (7, 7') designed for receiving low intensity, high-frequency reception signals (8), and loaded with a

continuing circuit at its output (4) for producing the high frequency reception signal (8); and

a control circuit (33) coupled to the output (4) of said amplification circuit (21) and producing a control signal (42) that is fed back to said transformation network (31) for producing a counter-coupling and linearizing effect in the high-frequency output of said amplification element output (24) and said at least one output of the passive antenna part (1), so that said input admittance (7') of said transformation network (31) is reduced when there is a reduction of the level of the high-frequency reception signal (8).

41. The active broad-band reception antenna according to claim 40, wherein the active reception antennas are used in an antenna diversity system of vehicles, and that the passive antenna parts (1) are selected so that their reception signal, that are present in a Rayleigh reception field, are as independent of one another as possible in terms of diversity, and that the high frequency reception signals (8) are made available without feedback, and without influencing the independence of the reception signals in terms of diversity, for selection in a scanning diversity system, and for further processing in one of the known diversity methods.

42. The active broad-band reception antenna according to claim 40, wherein the active reception antennas are used in an antenna diversity system for vehicles, and the passive antenna parts (1) are selected so that their reception signals that are present in a Rayleigh reception field, are as independent of one another as possible, in terms of diversity, and that the high-frequency reception signals (8) are made available without feedback, so as not to influence the independence of the reception signals in terms of diversity, for selection in a scanning diversity system, and for further processing in one of the known diversity methods, and that the level of the selected signal is passed to said common control amplifier (33), in which a control signal (42) is formed and passed to said transformation networks (31) in the active reception antennas, to reduce the selected high frequency reception signal (8).

43. The active broad-band antenna according to claim 40, wherein said control amplifier (33) is present in each of said active reception antennas (21), to monitor the high-frequency reception signals (8) at the antenna output.

44. The active broad-band antenna according to claim 40, comprising a plurality of susceptances, each coupled

parallel to the input of each amplifier circuit (12) to improve the independence, in terms of diversity, of the reception signals of the passive antenna parts (1) at their connection points (18) particularly determined for this purpose.

45. The active broad-band antenna according to claim 40, wherein said transmission network (31) is set for small high-frequency reception signals (8), the active admittance (5) in effect at the output (4) of said low-loss filter circuit (3) is structured by the input resistance of a high-frequency line (10) loaded with a load resistance (9) at its end, and that said load resistance (9) is formed by the input impedance of a continuing amplifier unit (11) having the noise number F_v , and that the real part G of the active admittance (7) is selected to be sufficiently large so that the noise contribution of said amplifier unit (11) is smaller than the noise contribution of said field effect transistor (2).

46. The active broad-band reception antenna according to claim 40 wherein the passive antenna part (1) comprises a passive antenna arrangement (27) having conductor structures disposed on plastic carrier introduced into the

recess of a conductive vehicle body, or onto the window of a vehicle, in the form of one or more heating fields and conductor structures separate from the heating system, and wherein several connection points (18) are provided on these conductor structures to form passive antenna parts (1), to connect said amplifier circuits (21).